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HISTORY AND SIGNIFICANCE OF AMERICAN WILDLIFE

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ORIGINAL WEALTH IN WILDLIFE

Previous to the coming of the white settlers, North America possessed an abundance and variety of wildlife not surpassed by any other continent. There were reasons for this: Wildlife, like vegetation, is modified as its habitat changes and it varies in form and abundance according to climate, soil fertility, and altitude. North America, with its crest in the icy Arctic and its base in the warm subtropical region of the Gulf of Mexico; with its Rocky Mountains in the West and its Alleghenies in the East; with its arid deserts, fertile plains, and well-watered valleys lying between, has within its boundaries almost every possible variation in temperature, precipitation, soil fertility, and vegetative cover. Altitudes range from ridges that are thousands of feet above sea level to depths of the Death

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Valley that are actually below sea level. Between the intense subzero temperatures of the Arctic wastes and the moist, tropical climate of the Isthmus of Panama are recorded infinite gradations of climate and temperature.

This diversity results in amazing differences in the types of both fauna and flora. The tiny lichen clinging to a glacier-scored rock protruding above the Arctic ice cap requires half a century for a few inches of growth, while along the Gulf the rank jungle springs up almost as rapidly as the axe and the machete can cut it down. The brown bear of Alaska--the largest meat-eating land animal, and the pigmy shrew, weighing less than one-fifth of an ounce, are alike able to find precisely the conditions each requires in order to live. So does the California condor, the largest living bird, with a wing spread of almost 10 feet, and so also does the wren, scarcely as large as one's thumb. The narwhal, the sea lion, the polar bear, and the manatee, together with thousands upon thousands of other species, have their homes on the shores of a continent where Nature seems to have exerted her limitless capacity for providing accommodation for the greatest possible number and variety of creatures.

The white pioneers, explorers, and trappers saw such an abundance of game and other wildlife when they came to North America that they could not adequately describe it. They spoke of flights of pigeons so tremendous that they "darkened the sun for hours on end," but the phrase has little meaning today, because we ourselves have never seen such spectacles and can scarcely imagine what they were like. Their tales of bison herds that covered the prairie for mile after mile also fail to give us a picture of the sights that met the wondering gaze of those early travelers. When those men noted a flight of wild fowl, they actually saw millions of individual ducks and geese; when we of today observe a flight of wild fowl, we are fortunate indeed if it numbers a few thousands.

ABUNDANCE UNIMPAIRED BY INDIANS

Enormous numbers of birds and other forms of wildlife were present despite the fact that the aborigines who inhabited the continent lived principally upon the fish and game. One might think it strange that wildlife should have persisted in such overwhelming abundance under constant utilization for human needs, whereas it declined before another race of men who lived principally upon agricultural products--upon grain, vegetables, milk, and the meat of domestic animals. When we examine the facts underlying this apparent inconsistency we shall find the answer to the conundrum in the different ways the two races used the land--the primordial domain of the native fauna--and in the relative sparseness of the Indian population.

The American Indians were gardeners but not farmers. In their small primitive plots they cultivated beans, corn, and tobacco, but in such limited quantities that had their families been compelled to depend upon these products alone, they would have starved. For food and clothing they depended for the most part upon wildlife and uncultivated native plants.

Then, too, the Indian population was sparse and shifting, scattered over the vast area of the New World. Their crude agricultural enterprises

made little or no impression on the primeval environment so favorable to the production of wildlife. With this productivity unchecked, the combined effects of all the hunting, trapping, and fishing done by all the tribes resulted in no material decrease of the constantly replenished supply.

The needs of the sparse Indian populations were less than the reproductive capacity of the game herds, and the Indians' weapons were not adapted to quick and easy killing of game. If some catastrophe had wiped out the Indian population, there would have remained in a year or two only a few scarcely discernible signs to indicate the hundreds of years of its occupancy, other than a few shell mounds here and there, the earthen burial mounds, the crude paintings in caves, and perhaps the smoke stains of cooking fires in a sheltered angle of a cliff. The Indian's trails and his gardens would alike have been overgrown and his rude huts and frail tepees disintegrated with the turns of the seasons as are the leaves and grasses of the passing year. The wild game and fur species, along with the forests, vegetation, rivers, lakes, aquatic life, and insect life, would soon have appeared unmarked and undamaged by the red man's long occupation of the land.

EXPLOITATION BY WHITE SETTLERS

But after only three hundred years of occupancy, the white man in this country, were he to be suddenly exterminated, would leave behind him enduring scars and open wounds that might never heal. After hundreds of years our concrete highways and our cities of stone and steel would be reduced and dissolved to some extent, but the geologist would still be able to find arid wastes, dust bowls, the scarred, eroded, treeless mountain sides, the choked and muddy streams, and the ruined marshland--melancholy monuments of the white man's civilization. The botanist would find valueless species of plant life growing where richly productive vegetation had once flourished, and the biologist would observe rats, cats, starlings, English sparrows, carp, and other such alien creatures usurping a land that was never meant for them. The entomologist would find other devastating evidences of our occupation and husbandry equally eloquent of our careless, wasteful, destructive habits.

Among the Indians it was the common practice to move to fresh hunting grounds whenever the old showed signs of becoming exhausted. Left unmolested, the former site was soon replenished, for its productivity and fertility had not been impaired. The Indian's gardening operations left a scar on the wilderness scarcely more permanent than that made by his canoe as he paddled along a lonely lake.

That he must never kill for sport was one of the commandments given to the Indian by the God who created the universe, according to the Iroquois legend. He was given dominion over the beasts of the field and the fowls of the air as in our own theology, but it was a provisional custodianship and tolerated neither waste nor abuse. Yet these same Iroquois, when presented with the opportunity to trade furs and meat for firearms, did not hesitate to despoil their wildlife resources in order to strengthen their

warfare on other tribes. The Indian never shared the white man's conception of sport; to provide meat and fish for himself and his family was a laborious task.

This different viewpoint and the fact that aboriginal Indian populations were too small and too poorly armed to deplete the game have led to the wide-spread idea that Indians were naturally conservative in their hunting. Actually they were very destructive at times; their buffalo drives and prairie fires set to trap game were just as wasteful, on a small scale, as any practices of the white man.

The white settlers and pioneers, no doubt, regarded game primarily as a source of food and clothing for it became the general practice among them to depend upon their professional hunters to bring the necessary supplies of game into the settlements, very much as the citizens of a modern community depend upon the butchers and the meat markets for that type of food. With the occupation of the land by the white settlers, however, wildlife began to diminish. The decrease was imperceptible at first, but it was definite nevertheless, for once the settlers had brought the primitive land under tillage or exploited it by industry, it long remained in that status. As they moved westward the new settlers subjugated more and more of the wild land, and the wildlife that remained in rear of the advancing line of frontiersmen and settlers was forced to adjust itself to a new environment--one that for most species was not nearly so favorable as it originally was.

The fertile ground that for ages had grown crops of wild game and fur animals was now required to grow corn, wheat, tobacco, beans, and cotton, and to support domestic flocks and herds. This condition, disastrous for many species, actually benefited others. The big-game species suffered first and most. While the bison, elk, deer, and bears were extirpated or forced to retire to areas remote from cultivation, some of the smaller creatures, including the quail, the rabbit, the raccoon, and the opossum, found the additional food supply grown by the farmer an encouragement to increase their numbers for a time and to extend their ranges.

INFLUENCE OF WILDLIFE ON COLONIZATION AND SETTLEMENT

The abundance of game and fur animals and of fishes aided the pioneers and settlers in establishing themselves in the new land; without it, indeed, rapid colonization would have been impossible. Supplies from Europe had to be brought over a long and hazardous ocean route, a communication line far too tenuous and inadequate to support even the smallest outpost of civilization against the rigors of the wilderness. For a long time after the land had been cleared and crops were being harvested, the settlers still found themselves dependent on the wild game and fur animals for a very considerable proportion of the essentials of life.

The white man's first knowledge of the nature of the great region lying west of the Mississippi came from the beaver trappers, or "mountain men"--the "long hunters"--so-called not because of their lean and rangy appearance, but from their custom of disappearing into the wilderness for months at a time. Resourceful, solitary men, they prided themselves on their

ability to do anything that the Indian could do, and do it better. These adventurers were perfectly fitted for the hazardous task of exploring the unknown western wilderness, and the beaver was the lodestone that drew them across the Plains to the Rockies and across the Rockies to Mexico and to the Pacific Northwest. But for these men the entire region of Northwestern United States would now in all probability be held by Great Britain, for they resisted the invasion of the coveted territory by Canadian fur traders and trappers, and thus first established the claim of the United States to the great Oregon territory.

EARLY TRAFFIC IN WILDLIFE AND ITS PRODUCTS

Except for the fur animals and the bison, there was for many years no direct exploitation of wildlife. It was at this time, however, that some of the great American fortunes were founded upon the fur trade, notably that of the Astor family. Their remote trading posts in a few years garnered the wealth of fur and left to posterity scarcely more than scattered remnants of what had been a tremendous resource. The pelts of fur animals and the hides of bison were commodities that would endure transportation from the wilderness to the settlements, but the flesh of game birds and mammals could not be sent back over the long trail.

Killing for the market did not become a serious factor in the reduction of game until stimulated by the growth of cities and towns nearer to the game fields and the development of railways. Traffic in game as food flourished after the Civil War and probably reached its peak in the 80's. During that time uncounted millions of passenger pigeons, prairie chickens, grouse, ducks, geese, upland plover, snipe, woodcock, quail, and other food species were annually sent to market by gunners who, except for a few months in midsummer, shot and snared game the whole year round. It was during this time that the passenger pigeon was exterminated and certain other game species were so badly reduced that they have never since recovered.

Strange to say, market shooting seems to have enriched no one engaged in it. Today a pair of canvasback ducks taken from the Susquehanna Flats and illicitly offered for sale will bring the poacher from \$3 to \$5 if he can conclude the transaction without being caught by Federal or State law-enforcement officers, in which case the offender may have to pay a \$500 fine and spend 6 months in jail. Much of the game earlier taken for the then legitimate market spoiled on its way, and what was sound and saleable brought prices so low that the receipts often were not sufficient to pay the gunner's expenses. Ducks, geese, and other game birds sold for a few cents a pair, and the business was so badly organized and competition so sharp that the markets were nearly always glutted. The written accounts of Bogardus and other market shooters afford some indication of the extent of the slaughter. They also refer to the uncertainty of profit and describe market shooting generally as a hard, laborious, and often hazardous enterprise. Yet it was continued until sportsmen and conservationists at the beginning of the present century became alarmed at the destruction and sought legislation to prohibit traffic in game.

The American bison, or buffalo, as the animal is more generally called, achieved military significance in the history of the country. It has been estimated that there were not fewer than 75,000,000 of these animals making up the vast herds that roamed the continent at the time the white man was establishing the first colonies. Buffalo were not, as many now suppose, a purely western species. At that time their range extended to the Atlantic seaboard, as did that of the elk. The hide hunters brought the buffalo to the very verge of extinction, and though it seems strange to us today, they had the full consent and approval of the United States Government to encourage them in the slaughter. The buffalo was the Plains Indians' base of supply, and the existence of vast herds on the hunting grounds made the subjugation of the hostile tribes difficult if not impossible of accomplishment by the armed forces of the United States. It was clear to the strategists in Washington that there could be no peace with the Indian and no complete conquest of the rich western lands until the buffalo had been destroyed, for these roving herds were supplying the Indian with nearly everything he needed in the way of food, shelter, and equipment.

The Government accomplished its purposes by aiding the buffalo hunters with free ammunition and supplies and by giving them military protection whenever possible. When the Sharps "buffalo gun" and the skinning knife had finished their work the Indians had been driven into the reservations, and the buffalo--the few hundred of them remaining--were gathered into preserves, most of which are now maintained by the same Government that a few years previously had so grimly sought annihilation of the animals. There they will remain unless in the unpredictable vicissitudes of time, and occasioned perhaps by the effect of land-utilization practices, great areas of their hereditary range are again restored to them and to the elk, deer, and antelope.

The swift and merciless exploitation of the buffalo only hastened an inevitable process, however, for in time the Indians must have retired before the constantly augmented numbers of settlers and the herds of domestic cattle would then have usurped the buffalo pastures. The history of the decline of this animal furnishes one of the most illuminating examples of the relationship existing between wildlife conservation and land utilization. Years of actual experience prove that these herds on Federal preserves can be increased indefinitely; that the buffalo might even be restored to original abundance locally, provided land were available.

The same is probably true of any form of wildlife. The principle is embodied in the national wildlife-restoration program now being conducted by the Fish and Wildlife Service. This program seeks the establishment of a system of refuges to furnish habitat for increasing the population of birds and animals and providing a surplus not now existent but one that will offset the losses from regulated shooting and other causes. Since 1924 the herd on the Bison Range in Montana--but one of four similar ranges administered by the National Service--has produced nearly 2,000 animals in excess of the carrying capacity of the range. That surplus and those from the other preserves, had they been released and allowed to reproduce under protection, would now have repopulated a considerable area. These increases, however, have contributed little or nothing to any broad restoration program, because

the continued utilization of range land for other purposes leaves now no room at all for the hereditary monarch of the prairies.

EXPLOITATION ERA CLOSING

The era of wildlife exploitation is now drawing to a close. Its last stages are marked by the increasing determination manifested by State and Federal agencies, by sportsmen and conservationists, and by the general public to apply methods and administrative policies of a positive nature for preventing further unnecessary losses of wildlife and for restoring the valuable species to the maximum abundance consistent with the conditions of a modern civilization. For many native American species the change of attitude has come too late to save them from extinction. The vanished species include the great auk, the Pallas cormorant, the Labrador duck, the passenger pigeon, the heath hen, the Eskimo curlew, and the Carolina parakeet. Of the mammals, the giant mink has gone and the grizzly bear has been nearly exterminated in the United States proper. Other species--the trumpeter swan, California condor, whooping crane, and ivory-billed woodpecker, to list a few of those threatened--may yet be added to that much lamented category of treasures forever lost to us.

Even though some of these birds and mammals still number thousands and are common enough to suggest the idea of abundance, it is possible that these long years of abuse have already inflicted fatal damage though the reduction is less than the numbers annually destroyed by natural enemies and other causes. These inimical agencies include not only the predatory creatures but climatic conditions, starvation, drought, and disease. These influences can seldom be defeated or nullified effectively by human interference, so that a species still apparently numerous may actually be doomed to extermination and be already beyond the hope of rescue by aid of human devices.

It is estimated that there are about 234,000 elk now remaining on the continent, 6,346,000 deer of all kinds, 153,000 bears, 100,000 wild turkeys, and possibly 100,000,000 wild ducks of all species. Comparison of these estimates with accounts of the wildlife resources present at the time of the coming of the white man affords a dismal realization of the extent of the damage done to what once was one of the richest resources of North America.

WILDLIFE MANAGEMENT THE REMEDY

But the situation is not so discouraging as these comparisons would seem to indicate on first analysis. The fact that after 300 years of continuous exploitation, neglect, and abuse there still remain considerable populations of nearly all common species demonstrates the amazing tenacity of the resource and suggests its profound recuperative power under more favorable conditions. W. L. McAtee, of the Fish and Wildlife Service, gives a vivid description of the ability of most species to multiply when freed from destructive influences. He states, "The most important factor bearing upon wildlife management is the amazing reproductive capacity of living things. . .to aid efforts to increase wildlife there is available a reproductive force almost explosive in its intensity."

Many attempts have been made to utilize this force in order that favored species--especially those classed as game--might increase. The Massachusetts colonies adopted ordinances to restrict the kill of certain species. Even the Indians maintained "bear preserves" whereon the bear, particularly valuable to them because of its fat, was never molested. Following settlement by the white man, this type of effort to increase game by restricting the kill appears with increasing frequency, until at the opening of the present century nearly if not all the States and the Canadian Provinces had adopted elaborate statutory codes designed to protect wildlife and enable it to multiply. The system, however, is only partially effective. Failure to realize to the full the intended benefits has been due to lax enforcement of laws, which has been occasioned in turn by negligible appropriations of money, by political interference, and by a general apathy on the part of the public, all of which are attributable to lack of appreciation of the seriousness of the problem confronting State and Nation.

But a deterrent factor even more potent was the seeming inability of wildlife administrators to realize that the reduction of the annual toll of game taken by gunners was only one part of a successful restoration plan. The missing element was that of planning for land utilization and management in such way as to preserve to the greatest degree possible the environmental conditions without which the wild creatures could not exist even though otherwise freed from human persecution. It is easy for us now to realize, for example, that the drainage and reclamation of about 100,000,000 acres of marshland in the United States alone operated as effectively to prevent the increase of waterfowl as did the guns of the market shooters. Similar conditions applied with equal force to other species. Cultivation, deforestation, lowering of water levels by drainage, and the pollution of many of the remaining natural reservoirs and streams placed upland game and other forms of wildlife under a tremendous handicap. Agriculture claimed not the fertile lands only--it invaded the submarginal areas as well--and the domain of the wild living things that required wilderness environment shrank away from the invader.

A LAND-USE PROBLEM

E. W. Nelson, a former Chief of the Bureau of Biological Survey, now the Fish and Wildlife Service, was one of the first to point to the truth, when in 1915 he began to urge the immediate acquisition of marsh and water areas to be set aside as permanent sanctuaries for waterfowl and other forms of wildlife. It was not until 1928, however, that there was finally passed the Migratory Bird Conservation Act, which authorized appropriations of funds amounting to about \$8,000,000 to be expended over a 10-year period for the purpose advanced by Dr. Nelson. Only about \$1,300,000 was actually appropriated, but by the passage of the act, Congress gave its endorsement to a national policy of wildlife restoration and declared the preservation of habitat to be a fundamental part of the Government's restoration plan. This act has since been supplemented by others and by the allocation of emergency funds designed to carry out these purposes.

Not only Congress but other legislative and administrative bodies and the people generally at last began to appreciate the value of preserving and restoring wildlife and to understand its intimate relationship to land

utilization. The long cycle of drought beginning in 1915 and continuing with an intensity almost unbroken for two decades was responsible for a new and mounting interest by the public in the condition of organic national resources of all kinds. Words and phrases descriptive of soil erosion, lowered water tables, and the destruction of vegetative cover had been meaningless terms and vague to the mind of the average citizen. Suddenly they became clothed with disturbing significances when the somber, baleful shadows of the dust storms drifted across the country, telling of the destruction of millions of tons of fertile soil, or when floods roared unchecked along the inland waterways like huge ruptured arteries spilling out the very life blood of the Nation. The conservationist now finds an interested and anxious audience where hitherto his warnings had been ignored or heard with tolerance and politely concealed contempt. The great hand of Nature was writing a message of foreboding; the symbols were whirling clouds of choking dust, thunderous torrents, dying cattle, and destitute humanity. The message means that the economic and social security of the Nation is utterly dependent upon the national ability to conserve and administer wisely the organic resources and products of the soil.

WILDLIFE NEEDS IGNORED DURING DEVELOPMENT PERIOD

From the time when the first activities by white men toward the colonization and settlement of the wild lands of North America were first undertaken, the greatest efforts and the best intelligence of the increasing population have been directed toward solving those problems that concern man in his relations to his fellows. Americans have displayed vision and ability to anticipate the needs and stresses of the future most convincingly in their development and application of social and political principles. They have created a form of government in conformity with their convictions of liberty and equality among men that has been of sufficient strength to maintain the country's position among other nations of the world, but in accomplishing these things another relationship of fundamental importance was for a long time ignored. For centuries America sent few ambassadors to Nature, within whose realms lie the Nation's most profound interests and responsibilities. Laws have been made, institutions raised, universities established, and long wars fought to preserve the doctrine of human rights, while all around us and beneath our feet the essence of human and all other life as well has flowed away unchecked, the wasting of a vital natural resource nearly unnoticed.

In its disregard of the fact that the natural resources of any land are not inexhaustible, American civilization has shown no greater degree of ignorance than has been exhibited since the dawn of history by every race or nation whose destiny it has been to discover new lands and to occupy them. The histories of the continents that mankind has discovered during the ages since the first nomadic tribes emerged from central Asia may all alike be written under the same three chapter titles--Exploration, Exploitation, and Exhaustion. It would seem that as man's intelligence developed and as greater knowledge came to him, his treatment of the soil and its products--organic and inorganic--would grow less and less wasteful and destructive as the vital nature of his dependence upon these things became more and more apparent.

Actually the opposite thing has occurred. Man has used his intelligence and growing ingenuity in ways to hasten the destruction of natural resources and to reduce the interval of time elapsing between the exploration of new fertile territory and the exhaustion of the greater part of its natural wealth. The ravage of Asia was a slow process, one that required thousands of years to accomplish with the crude implements that early man had been able to invent. In less than four and a half centuries since Columbus made the discovery that introduced the most profligate era the world will ever know, the most fertile part of the continent of North America has been reduced to a condition so nearly comparable with the Asiatic scene as to be appalling.

An astute European who visited our country at a time when the carnival of destruction was well under way remarked that Americans regarded trees as enemies and felt that they did well to cut them down. They had the same hostile attitude toward streams and natural reservoirs of water; toward the tough-rooted grasses that clogged the plow; and toward every wild creature inhabiting the prolific region. It was as if the race, impatient of the slow processes of evolutionary doom, seized upon every device and contrivance that could be used to hasten the end. In some phases of modern warfare "scorched earth" is now a recognized weapon for the destruction of an enemy. Its strategy requires the destruction of every living thing upon the land and even the organic resources of the soil itself. For three centuries Americans have been employing the scorched-earth strategy, not against a hostile power, but most effectively against themselves and their institutions.

AWAKENING TO THE DANGERS WHICH MENACE THE RESOURCE

A study of the history of the conservation of organic resources, including wildlife in France, Germany, and the British Isles, furnishes ground for encouragement to conservationists in this country. Here we find indications that at some stage in the process of land utilization the inhabitants of these older countries became aware of the dangers of uncontrolled exploitation and were able to enforce corrective measures in time to ward off complete disaster. In all these countries the problem of water pollution has largely been solved and the natural reservoirs of water have been augmented by artificial works. The technique of soil conservation is at an advanced stage, and while the preservation of forests and wildlife has been effectively secured, in some instances it has been accomplished by the use of methods that would be repugnant to the average American.

There is good reason to conclude that American civilization has at last progressed to the point where the essential values of these organic resources is being recognized. Conservation agencies are now asked to develop programs to insure for the future the orderly use and protection of these things.

Perhaps the most important of the belated developments is recognition of the fact that all activities concerned with the improvement or replenishment of organic resources are related and must be completely coordinated if

any one is to be successful. No wildlife conservation project, even of small scale, can be ultimately successful unless it includes the technique of soil, cover, and water conservation. Moreover, agriculture, forestry, and the conservation of water resources are materially enhanced by the use of methods beneficial to wildlife.

PLANNING FOR WILDLIFE RESTORATION

In planning the national wildlife-restoration program there are three requisites to be recognized. The first of these is for land to be set aside upon what may be called the hereditary wildlife ranges for the preservation of all native species. From these reserves the seed stock may be drawn whenever it is necessary or desirable to restock denuded areas. Extensive surveys of game and other kinds of wildlife provide the information to indicate the regions where these reserves should be established with the greatest prospect of success. Provision must be made to insure against the total loss of any species through disease or through some other natural disaster that may conceivably eliminate all the seed stock on a single preserve. For example, bison must be maintained on several widely separated ranges, and similar precautions will have to be taken by the Nation with respect to other species. It is anticipated that seed stock from these Federal reserves may be needed to carry out State and Federal restoration programs in the future on areas made available under improved land-utilization programs.

The second requisite of the program is to provide for the continuation of research work to accumulate factual information applicable to current problems, and also to enable wildlife administrators to anticipate future needs. Wildlife as a resource is subjected to constantly varying conditions occasioned by many physical influences. These may be of natural origin or may result from engineering, industrial, or agricultural operations. Programs must be so planned as to furnish facts to enable wildlife agencies to obtain the most favorable results from current developments. The Fish and Wildlife Service has set up stations for regional wildlife research in selected land-grant colleges throughout the United States. Ten of these already have been established, and four more are needed if the project is to be fully adequate.

By fulfilling the second requisite the third will also be met--that of providing for a carefully trained personnel to administer the wildlife resources of America in the future. There is now a serious lack of men who are qualified for this work. The land-grant college cooperative units will serve as research stations, and they will also offer to graduate students courses in wildlife management similar in purpose to those offered in forestry.

The main objective of the Federal-State wildlife-restoration program now being developed is to prevent, if possible, the extermination of any valuable species of wild birds and other animals, and to increase their numbers to the greatest extent consistent with the land-use requirements of the human population. Wildlife has a very great economic value, and it also furnishes a means for recreation and relaxation that may well become of even greater importance than are its financial values to human beings subjected to the increasing strains and stresses of modern ways of living and working.

Several valuable and interesting species were allowed to become extinct in the years before there was any general conception of the need for a carefully worked out wildlife-conservation program that could be coordinated with agricultural and industrial activities. It is bad logic to argue that because there is no realization of a loss no loss has been suffered. The present generation of Americans never knew, nor can any ever know, the passenger pigeon and the heath hen, but it is a certainty that modern life is the poorer for the extermination of these birds. Then, too, there is always the active possibility that the extermination of any native creature may cause grave disturbances in the complicated ecological system of a country. Evidences of such damage and a realization of its significance may not appear for many years following the disaster.

FACT-FINDING BASIS FOR PLANS

Such in brief is the philosophy underlying the recent restoration activities and plans in the United States. Actually these plans have been developed over a period of more than 55 years of research and study by technicians on the staff of the Fish and Wildlife Service. Facts slowly accumulated throughout the period have been brought together, like the sections of an aerial landscape photograph, until a definite, recognizable pattern has appeared. When at last the means to proceed with a program were provided, the essential needs were known as well as the methods by which they could be met.

The principal need was for land. Bird-banding, food-habits, and habitat studies conducted for half a century furnished precise information as to the type of land required to support each of the many different species. It was realized that, except for the habitats of such creatures as find suitable environmental conditions upon cultivated lands, most of the areas that might be devoted to the restoration program would necessarily be of types not adapted to profitable agricultural uses; or that they would be situated where the results of the soil-conservation and water-control measures necessary for wildlife-management operations would be of great importance to the general land-utilization program.

For the minimum requirements of waterfowl, about 7,500,000 acres of marsh and water refuge areas are needed on the breeding grounds, along the courses of the four major flyways, and on the wintering grounds used by these birds. Nearly 3,000,000 acres, particularly for migratory waterfowl, have now been acquired or are in process of acquisition. The areas making up the remainder are already known and can be acquired as means are provided.

To maintain adequate stocks of other birds and mammals in the United States, Alaska, Hawaii, and Puerto Rico, about 85,000 acres have been set aside for colonial nongame species; over 10,500,000 acres for big game, and almost 4,000,000 acres for migratory and miscellaneous forms of wildlife. The completion of this acquisition and development program will not dispose of the problem, however, since conditions governing land use do not remain stable and immutable. They must change constantly to meet the constantly changing requirements of the people, and provision for the maintenance of wildlife must be sufficiently flexible to allow adjustment.

DEVELOPMENT OF WILDLIFE-PROTECTIVE LEGISLATION

In addition to the regular appropriations made to the Service for research, game management, and regulatory activities, two acts of Congress now provide moderate but continuing funds for a land-utilization and development program. The first of these is the Federal Migratory Bird Hunting Stamp Act of 1934, which annually supplies more than a million dollars for land acquisition and use in the waterfowl-restoration program. The second, enacted in 1937, is the Federal Aid to Wildlife Restoration Act, authorizing the annual appropriation of amounts equal to the revenues received from the tax on sporting arms and ammunition. The revenue from this excise tax has amounted to more than \$3,000,000 annually. Funds appropriated under this Federal-aid measure are allotted to the States on a cooperative basis whereby each participating State pays at least one-fourth of the total cost of the projects undertaken under the terms of the act. Inasmuch as the act principally requires and specifically encourages the State conservation agencies to use these Federal allotments to acquire and develop lands for wildlife purposes, it is apparent that over a period of years many millions of acres of land will be gradually added to the total area now available for wildlife. In addition, surveys and investigations into problems of wildlife management form an important part of this cooperative wildlife-restoration program.

The development of land-use policies favorable to wildlife is gradually bringing about an important change in the utilization of wildlife itself. Laws, regulations, and ordinances concerned with the taking of game, fur animals, and fishes constitute a class of legislation that is nearly as old as the history of the white man in America. By such measures the colonists tried to maintain an abundance of wildlife within easy reach of their settlements. Unable as yet to depend entirely upon their crops and domestic animals for food and clothing, it was important that the settlers be able to supplement their supplies from the adjacent wilderness. They endeavored to conserve conveniently available resources of game and fish by regulating individual use. This form of regulation, however, did not produce the desired results. Game and fur soon became scarce in the vicinities of the settlements, and hunters and trappers were compelled to go farther and farther into the wilderness.

Since that early effort thousands and thousands of similar laws have been enacted and many millions of dollars have been spent in attempts to prevent the individual from taking more than specified quantities of game, fishes, and fur from the common supplies. It has been only in recent years that results have been even partially satisfactory or have seemed to justify the trouble and expense involved. Many thoughtful and informed conservationists reached the conclusion that game laws were utterly ineffective to check the decrease of wildlife. The hunters and trappers, the courts, and the public alike regarded such legislation as being of little consequence. Politicians were interested in the game codes only because they gave wildlife a market value in exchange for votes and preference--values that would otherwise have been lacking. Even the individual sportsman found it hard to convince himself that his observance of the laws would be beneficial in perpetuating game birds and mammals.

ATTITUDE FAVORABLE TO RESTORATION AS GOVERNMENT FUNCTION

Within the past few years a change has taken place in the American attitude toward legislation designed to regulate the use of game and other wildlife, and a new and more wholesome sentiment is rapidly developing. The reasons are many, and some of them are obscure, but among the most important has been the general realization by the States of the great value of their resources of fish and game, accompanied by a determination to remove wildlife administration from the danger of political interference. Another reason for the growth of new confidence is that in many parts of the country it has been demonstrated that laws controlling the utilization of wildlife need not be ineffective; that they are, in fact, indispensable in programs for the restoration and maintenance of this great resource. Wherever game animals have been established in suitable environment and the kill has been regulated so as to be somewhat less than the rate of production, the species has invariably increased.

In the past, and even at the present time, the major part of laws and regulations to control utilization of wildlife is of a sort that attempts to restrain the individual from taking more than a specified number of birds or mammals in a day, or a week, or during an entire open shooting season. These laws prohibit the use of certain weapons and devices; they prescribe certain hours each day when the taking of game is permitted; and in many other ways they work to reduce the kill by limiting the activities of the individual hunter or trapper. The principle is quite similar to a system of physical handicapping, and like such a system it is not invariably equitable or satisfactory.

There is now a noticeable tendency to modify the principle of conservation laws. Administrators have discovered that if adequate areas are set aside and managed as wildlife reservoirs they will produce surplus stocks of game, which move outward from the protected lands to occupy adjacent regions. Such surpluses on open areas may be safely used without reducing the annual supply from the productive sanctuary zones. The closed-area system of game protection greatly reduces law-enforcement problems. It is much easier to prevent all shooting or trapping on a number of sanctuaries than it is to maintain supervision over the personal activities of a large number of gunners in such way as to compel each of them to obey every requirement of a complex code. The decision to extend the open season on waterfowl to 80 days in 1944 was based partly upon evidence of an increasing number of birds and partly upon the realization that there are now almost 200 Federally owned waterfowl sanctuaries established at strategic points throughout the country to give security against the dangers of overshooting.

It is not at all likely that this new method to govern utilization of game birds and fur and other animals by means of closed or sanctuary zones will replace the established type of restricted seasons and bag limits as prescribed by game and fur laws, but it should eventually permit simplifications of those codes and the repeal of many of the so-called nuisance regulations.

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